

REMARKS/ARGUMENTS

This paper is being provided in response to the October 6, 2003 Office Action for the above-referenced application. In this response, Applicant has amended Claims 1, 3, 4, 14, 16, 18-21, 23-25, 27, 29-35, 37, 40 in order to clarify that which Applicant deems to be the claimed invention. Applicant respectfully submits that the amendments to the claims are all supported by the originally filed application.

In response to the objection to the title, Applicant has amended the title in accordance with remarks set forth in the Office Action. Accordingly, Applicant respectfully requests that the objection be reconsidered and withdrawn.

In response to the objection to the abstract, Applicant has amended the abstract in accordance with remarks set forth in the Office Action. Accordingly, Applicant respectfully requests that the objection be reconsidered and withdrawn.

In response to the objections to the drawings as not being clearly or adequately labeled as set forth in paragraph 3 of the Office Action, Applicant has amended the drawings in accordance with remarks set forth in the Office Action. Applicant respectfully submits that the amendments to the drawings do not add any new matter but simply clarifies the original drawings.

In response to the objection to the drawings under 37 C.F.R. 1.83(a) as set forth in paragraph 4 of the Office Action, Applicant respectfully submits that Figure 14 includes element 152 which, as described in the specification, for example, at page 21, line 19-page 22, line 4, is hardware used to process a request for cache data in accordance with one of the techniques

described in the specification. Accordingly, Applicant respectfully submits that element 152 includes the hardware for processing such a request in accordance with Claims 25 and 26.

Claim 25 recites that the cache selection hardware further includes: first hardware for selecting the first cache memory for accessing the control data; and second hardware, coupled to the first hardware, for accessing the second cache memory for the disk data corresponding to the control data when said first cache memory is used for accessing the control data. Claim 26 recites that the cache selection hardware further includes: third hardware for selecting the second cache memory for accessing the control data; and fourth hardware, coupled to the third hardware, for accessing the first cache memory for the disk data corresponding to the control data when said second cache memory is used for accessing the control data. Steps 82' and 82'', respectively, of Figures 9 and 10 illustrate two possible techniques that may be used in obtaining control data from one of the first cache memory and the second cache memory. Additionally, Figure 11 describes steps for reading disk data from the other of the first and second cache memories not used to obtain the control data. As described in the specification and pointed out above, the hardware 152 of Figure 14 includes hardware to process the requests in accordance with the foregoing techniques of Figures 9, 10 and 11 which provide support for Claims 25 and 26. Thus, Applicant respectfully submits that hardware 152 includes the first, second, third and fourth hardware elements as recited in Claims 25 and 26. In view of the foregoing, Applicant respectfully requests that this objection be reconsidered and withdrawn.

In response to the objections to the specification set forth in paragraph 5, Applicant has amended the specification in accordance with remarks set forth in the Office Action. Accordingly, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

In response to the objection to the specification as failing to provide proper antecedent basis for the claimed subject matter as related to “machine executable code” for Claims 19-28 and 21-41, Applicant respectfully submits that the application as filed includes support for the recited machine executable code as set forth in the claims. In particular, Applicant refers to the Summary of the Invention section, at page 4, lines 1-8 as support for the recited machine executable code. In view of the foregoing, Applicant respectfully requests that the objection be reconsidered and withdrawn.

In response to the objections to the claims, Applicant has amended the claims in accordance with remarks set forth in the Office Action. Accordingly, Applicant respectfully requests that the objection be reconsidered and withdrawn.

In response to the rejection of Claims 1-41 under 35 U.S.C. 112, second paragraph, Applicant has amended the claims in accordance with remarks set forth in the Office Action. Accordingly, Applicant respectfully requests that the objection be reconsidered and withdrawn.

The rejection of Claims 1-2, 4-7, 12-32 and 34-37 under 35 U.S.C. § 103(a) as being unpatentable over Dewey et al. (U.S. Patent No. 5,724,501, hereinafter referred to as “Dewey”) in view of Kurokawa et al. (U.S. Patent No. 6,571,350, hereinafter referred to as “Kurokawa”) is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that Claims 1-2, 4-7, 12-32 and 34-37, as amended herein, are patentable over the cited references.

Applicant's Claim 1, as amended herein, recites a method of managing data in a cache. A first cache memory containing data is provided. A second cache memory containing data is provided, wherein at least some of the data contained in the first cache memory is the same as at least some of the data contained in the second cache memory. In response to a request for data that is stored in both the first cache memory and the second cache memory, one of the cache memories is chosen to use to obtain the requested data according to an access balancing technique. Claims 2, 4-7, and 12-17 depend from Claim 1.

Applicant's Claim 18, as amended herein, recites a system for managing data in a cache including: a first cache memory including data; a second cache memory including data wherein at least some of the data included in the first cache memory is the same as at least some of the data included in the second cache memory; and cache selection hardware for selecting, in response to a request for data that is stored in both the first cache memory and the second cache memory, which one of the first and second cache memories to use to obtain the requested data in accordance with an access balancing technique. Claims 19-30 depend from Claim 18.

Applicant's Claim 31, as amended herein, recites a computer program product stored on a computer readable medium for managing data in a cache, including: machine executable code for providing a first cache memory containing data; machine executable code for providing a second cache memory containing data, wherein at least some of the data contained in the first cache memory is the same as at least some of the data contained in the second cache memory; and machine executable code for, in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to

obtain the requested data according to an access balancing technique. Claims 32, and 34-37 depend from Claim 31.

Dewey relates to improvements in fault tolerant data processing systems and methods. (Col. 1, Lines 6-7). To facilitate quick recovery of data lost as a result of a controller of cache failure, the memory module associated with a failed controller is placed in a failover mode in which data is recovered in two stages using a battery backup. (Col. 4, Lines 15-21). Upon a controller failure, the metadata is first copied to a backup controller over a serial link. During a secondary recovery stage, the backup controller processes new host commands in the foreground and fetches mirrored data from the failed cache in the background. (Col. 4, Lines 29-37).

Kurokawa discloses a data handling system having a redundant storage configuration. (Col. 1, Lines 8-9). Kurokawa's Figure 1 includes duplicate data storage in separate storage units SU(0) 16 and SU(1) 26. One of the storage units SU(0) and SU(1) performs as a master and the other as a sub storage in accordance with each address. (Col. 4, Lines 57-63; Figure 1). The master storage regions and sub storage regions are interleaved. (Col. 5, Line 65-Col. 6, Line 5; Figure 2). Kurokawa's Figure 8 includes a work storage WS unit in each of SU(0) and SU(1). Each WS is a cache memory smaller than the main storage which retains copies of a part of data in the main storages. Given a store or fetch request, the storage unit SU(0) or SU(1) stores or fetches data directly to or from the WS(0) or WS(1) when the WS(0) or WS(1) contains the desired data to be referenced. When the desired data is not found in WS(0) or WS(1), the storage SU(0) or SU(1) fetches a block of data including the desired data from the MS(0) or MS(1) and transfers the block in the WS. The storage unit SU(0) or SU(1) again accesses the WS(0) or WS(1) for a fetch or a store operation. (Col. 9, Line 60-Col. 10, Line 27; Figure 8).

Applicant's Claim 1, as amended herein, is neither disclosed nor suggested by the references in that the references, taken separately or in combination, neither disclose nor suggest *a method of managing data in a cache, comprising: providing a first cache memory containing data; providing a second cache memory containing data, wherein at least some of the data contained in the first cache memory is the same as at least some of the data contained in the second cache memory; and in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in Claim 1. Dewey appears silent with regard to any disclosure or suggestion of selecting a cache memory for use in obtaining data according to an access balance technique when the data is stored in more than one cache memory. Kurokawa discloses, in his Figure 2, making a determination as to what storage unit will be a master and which will be a sub storage based on address. Kurokawa discloses storage units that each include a work storage WS that is a cache memory. Kurokawa discloses determining whether desired data is in a WS for a single storage unit and taking actions in response thereto, but appears silent with regard to taking any action in response to a request for data stored in first and second cache memories, or WSs, as used within Kurokawa. In particular, Kurokawa does not disclose or suggest choosing a cache memory to use to obtain requested data when the data is stored in first and second cache memories. Accordingly, the references neither teach, disclose nor suggest at least the feature of *in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in Claim 1.

For reasons similar to those set forth regarding Claim 1, Applicant's amended Claim 18 is also neither disclosed nor suggested by the references, taken separately or in combination in that the references neither disclose nor suggest *a system for managing data in a cache comprising: a first cache memory including data; a second cache memory including data wherein at least some of the data included in the first cache memory is the same as at least some of the data included in the second cache memory; and cache selection hardware for selecting, in response to a request for data that is stored in both the first cache memory and the second cache memory, which one of the first and second cache memories to use to obtain the requested data in accordance with an access balancing technique*, as set forth in amended Claim 18.

For reasons similar to those set forth regarding Claim 1, Applicant's amended Claim 31 is also neither disclosed nor suggested by the references, taken separately or in combination in that the references neither disclose nor suggest *a computer program product stored on a computer readable medium for managing data in a cache, comprising: machine executable code for providing a first cache memory containing data; machine executable code for providing a second cache memory containing data, wherein at least some of the data contained in the first cache memory is the same as at least some of the data contained in the second cache memory; and machine executable code for, in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in amended Claim 31.

In view of the foregoing, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

The rejection of Claims 3 and 33 under 35 U.S.C. § 103(a) as being unpatentable over Dewey in view of Kurokawa as applied to claims 1-2, 4-7, 12-32 and 34-37, and further in view of Mason et al. (WO 99/15957, hereinafter after referred to as “Mason”) is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that Claims 3 and 33, as amended herein, are patentable over the cited references.

Claim 3 depends from Claim 1, and Claim 33 depends from Claim 31. For reasons set forth above, Claims 1 and 31 are neither disclosed nor suggested by Dewey and Kurokawa. For reasons set forth below, Applicant respectfully submits that combining Dewey and Kurokawa with Mason also neither discloses nor suggests Claims 1 and 31, and claims that depend therefrom.

Mason relates to mass storage systems in which stored logical volumes are duplicated in mirror form. (See page 1, lines 4-7). Mason describes dynamically adjusting the mirror policy for a disk drive system by periodically collecting statistics for the reading and writing of data to mirrored logical volumes and determining from the collected statistics whether the mirror service policy should continue or change. (See Abstract).

Applicant's Claim 1, as amended herein, is neither disclosed nor suggested by the references, taken separately or in combination, in that the references neither disclose nor suggest ***a method of managing data in a cache, comprising: providing a first cache memory***

containing data; providing a second cache memory containing data, wherein at least some of the data contained in the first cache memory is the same as at least some of the data contained in the second cache memory; and in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique, as set forth in Claim 1. For reasons set forth above, Dewey and Kurokawa do not disclose or suggest at least the feature of *in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique,* as set forth in amended Claim 1.

Mason makes no mention of choosing a cache memory to use if requested data is stored in first and second cache memories. Mason discloses dynamically adjusting a disk mirror service policy and makes no mention of cache comparisons or selections, and taking an action in response thereto as in Applicant's amended Claim 1. Thus, Mason also appears silent with regard to the feature of *in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique,* as set forth in amended Claim 1.

Thus, Mason does not overcome the deficiencies of Dewey and Kurokawa with respect to Applicant's amended Claim 1. Accordingly, the references neither teach, disclose or suggest at least the feature of *in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique,* as set forth in amended Claim 1.

For reasons similar to those set forth regarding Claim 1, Applicant's Claim 31 is also neither disclosed nor suggested by the references, taken separately or in combination in that the references neither disclose nor suggest *a computer program product stored on a computer readable medium for managing data in a cache, comprising: machine executable code for providing a first cache memory containing data; machine executable code for providing a second cache memory containing data, wherein at least some of the data contained in the first cache memory is the same as at least some of the data contained in the second cache memory; and machine executable code for, in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in amended Claim 31.

In view of the foregoing, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

The rejection of Claims 1-2, 4-7, 12-32 and 34-37 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-35 of U.S. Patent No. 6,591,335 (the '335 patent) or Claims 1-19 of U.S. Patent No. 6,604,171 (the '171 patent), each taken separately, in view of Kurokawa, is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that Claims 1-2, 4-7, 12-32, and 34-37, as amended herein, are patentably distinct over the Claims 1-35 of the '335 patent and Claims 1-19 of the '171 patent, taken separately, in view of Kurokawa.

Applicant's amended Claim 1 recites, in part, *in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in amended Claim 1. The claims of the '335 patent and the claims of the '171 patent do not describe or suggest such a feature as set forth in Applicant's amended Claim 1. For reasons pointed out above, Kurokawa also neither discloses nor suggests such a feature as set forth in Applicant's amended Claim 1. As described above, Kurokawa discloses selecting a particular storage unit (SU) as a master or sub storage based on address, but neither discloses nor suggests making any comparison or taking any action regarding whether a request for data is stored in both caches (WSs). Rather, Kurokawa discloses taking an action with respect to a single WS, such as fetching and transferring a block of data into a WS if the desired data is not already in WS.

Accordingly, Applicant's amended Claim 1 is patentably distinct over Claims 1-35 of the '335 patent and claims 1-19 of the '171 patent, taken separately, in view of Kurokawa.

For reasons similar to those regarding Claim 1, Applicant's amended Claim 18 is also patentably distinct over Claims 1-35 of the '335 patent and claims 1-19 of the '171 patent, taken separately, in view of Kurokawa in that amended Claim 18 includes the feature of *cache selection hardware for selecting, in response to a request for data that is stored in both the first cache memory and the second cache memory, which one of the first and second cache memories to use to obtain the requested data in accordance with an access balancing technique*, as set forth in Claim 18.

For reasons similar to those regarding Claim 1, Applicant's amended Claim 31 is also patentably distinct over Claims 1-35 of the '335 patent and Claims 1-19 of the '171 patent, taken separately, in view of Kurokawa in that amended Claim 31 includes the feature of *machine executable code for, in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in Claim 31.

Accordingly, in view of the foregoing, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

The rejection of Claims 3 and 33 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-35 of U.S. Patent No. 6,591,335 (the '335 patent) or Claims 1-19 of U.S. Patent No. 6,604,171 (the '171 patent), each taken separately, in view of Kurokawa, and further in view of Mason, is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submit that Claims 1-2, 4-7, 12-32, and 34-37, as amended herein, are patentably distinct over the Claims 1-35 of the '335 patent and Claims 1-19 of the '171 patent, each taken separately, in view of Kurokawa and further in view of Mason.

For reasons set forth above, Applicant's Claims 1 and 31, as amended herein, are patentably distinct over Claims 1-19 of the '171 patent, and Claims 1-35 of the '335 patent, each taken separately, in view of Kurokawa. Applicant's Claims 1 and 31 are also patentably distinct when the foregoing is also combined with Mason since Mason also neither discloses nor suggests *in response to a request for data that is stored in both the first cache memory and the second*

cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique, as set forth in amended Claim 1, and also neither discloses nor suggests *machine executable code for, in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in amended Claim 31. As set forth above, Mason makes no mention of choosing a cache memory to use if requested data is stored in first and second cache memories. Mason discloses dynamically adjusting a disk mirror service policy and makes no mention of cache comparisons or selections, and taking an action in response thereto as in Applicant's amended Claim 1. Thus, Mason also appears silent with regard to the feature of *in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in amended Claim 1, and *machine executable code for, in response to a request for data that is stored in both the first cache memory and the second cache memory, choosing which one of the cache memories to use to obtain the requested data according to an access balancing technique*, as set forth in amended Claim 31.

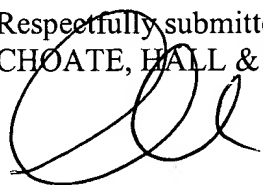
In view of the foregoing, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

The rejection of Claims 31-41 under 35 U.S.C. § 101 directed to a non-statutory subject matter is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that Claims 31-41, as amended herein, are directed to statutory subject

matter. In view of the foregoing, Applicant respectfully requests that the rejection be reconsidered and withdrawn.

Based on the above, Applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4042.

Respectfully submitted,
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Date: December 17, 2003



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to
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A

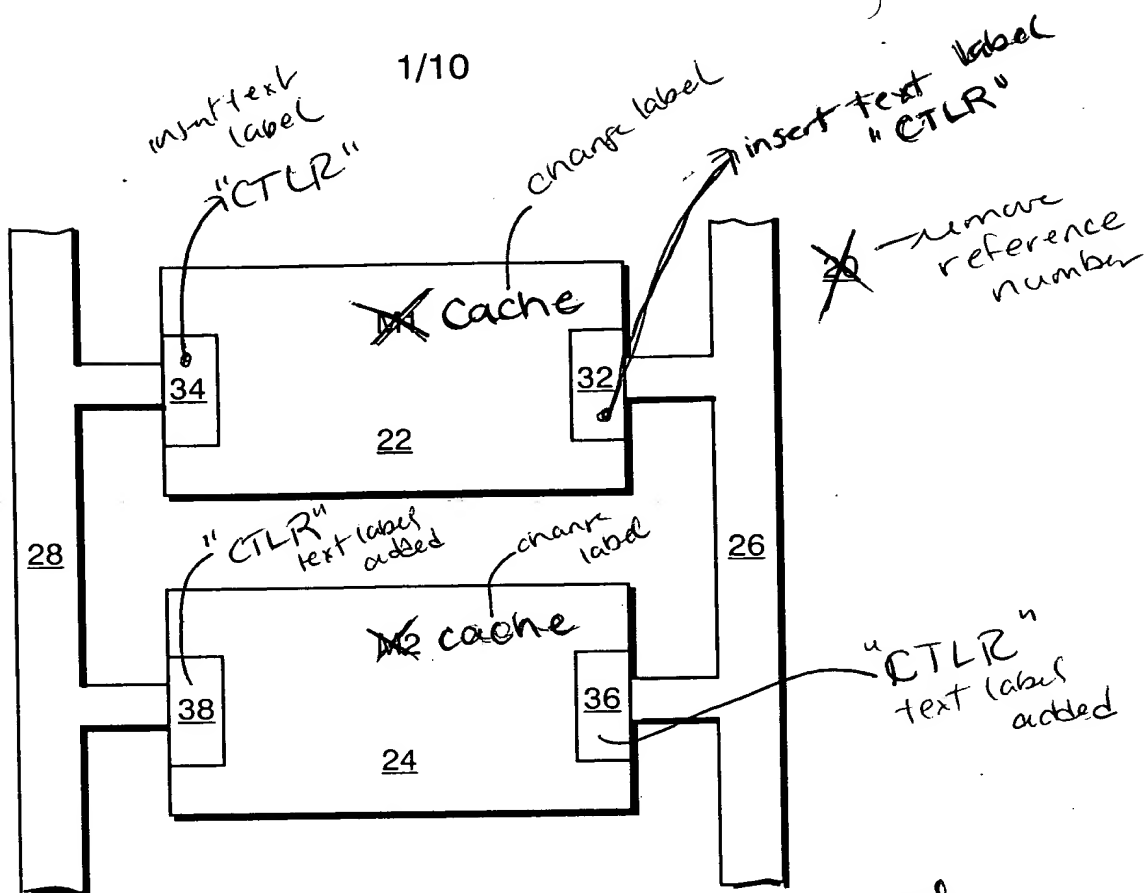


FIG. 1A

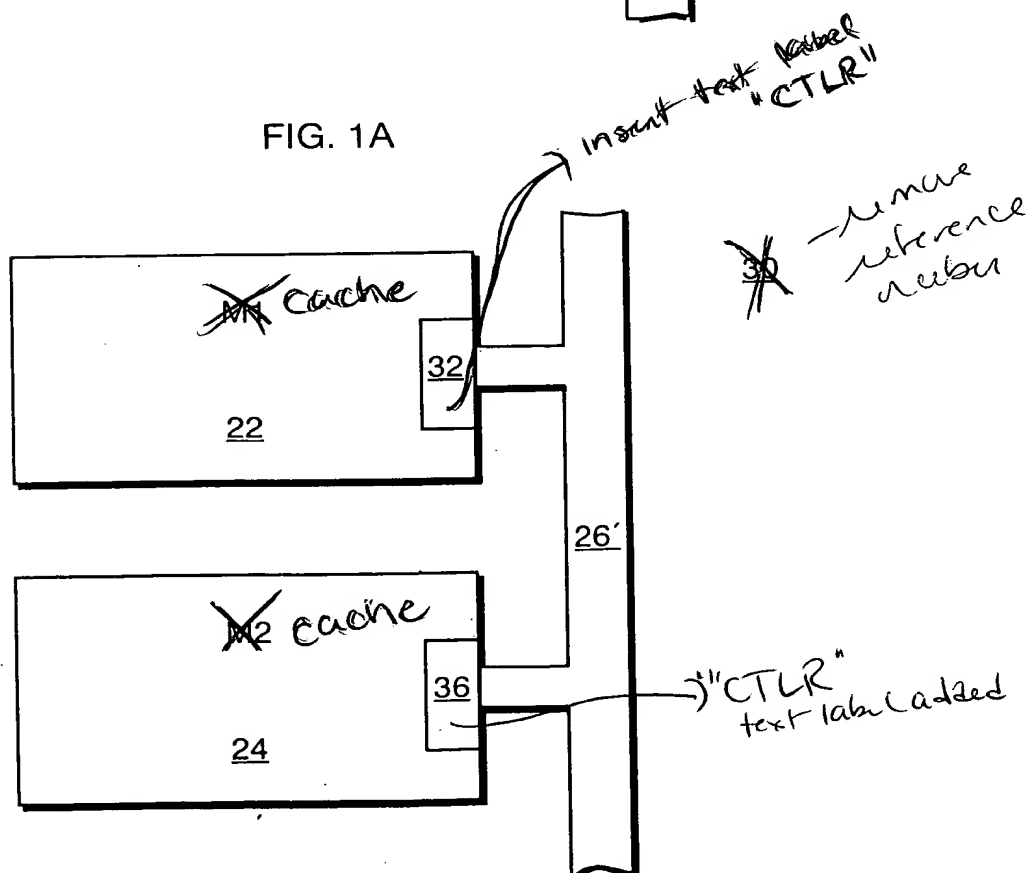


FIG. 1B

A +

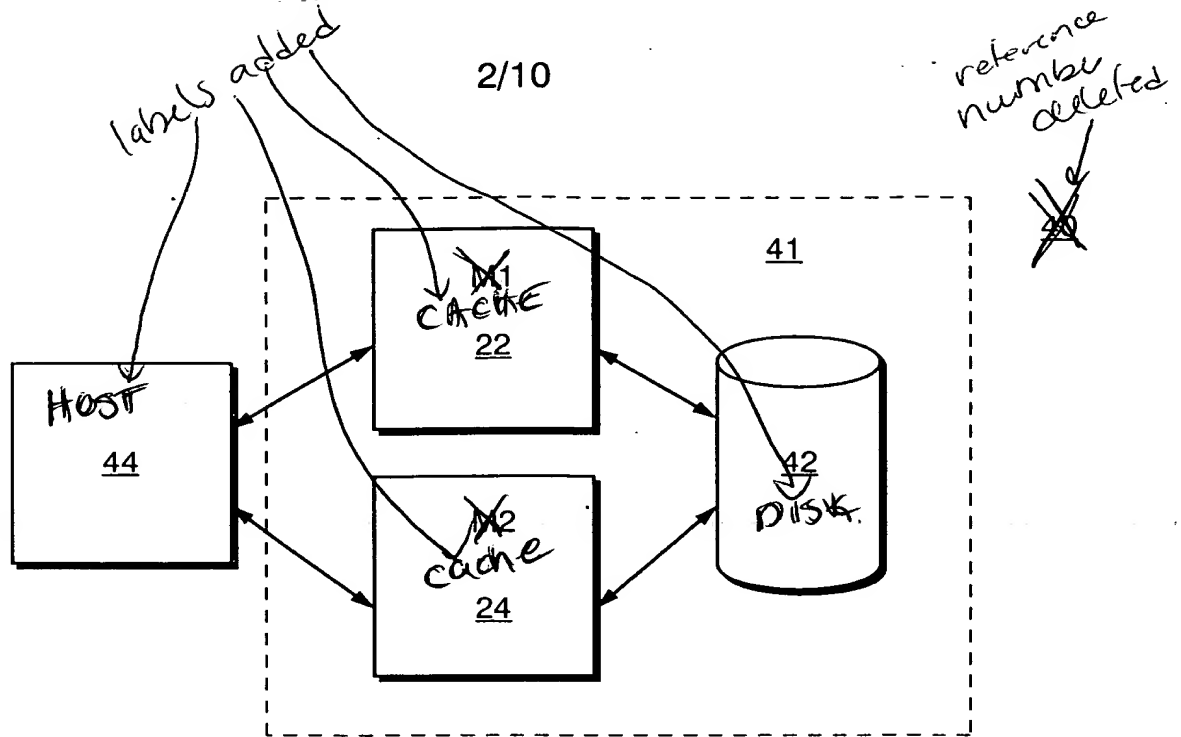


FIG. 2

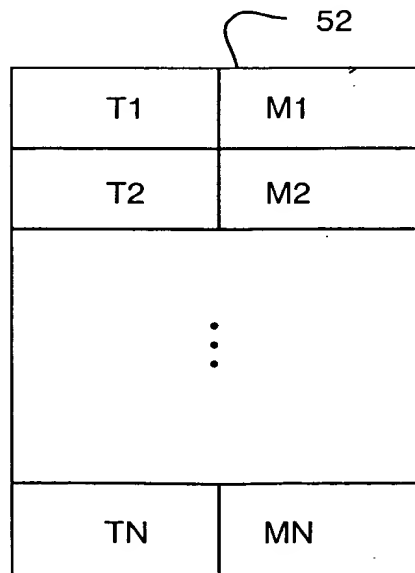


FIG. 3



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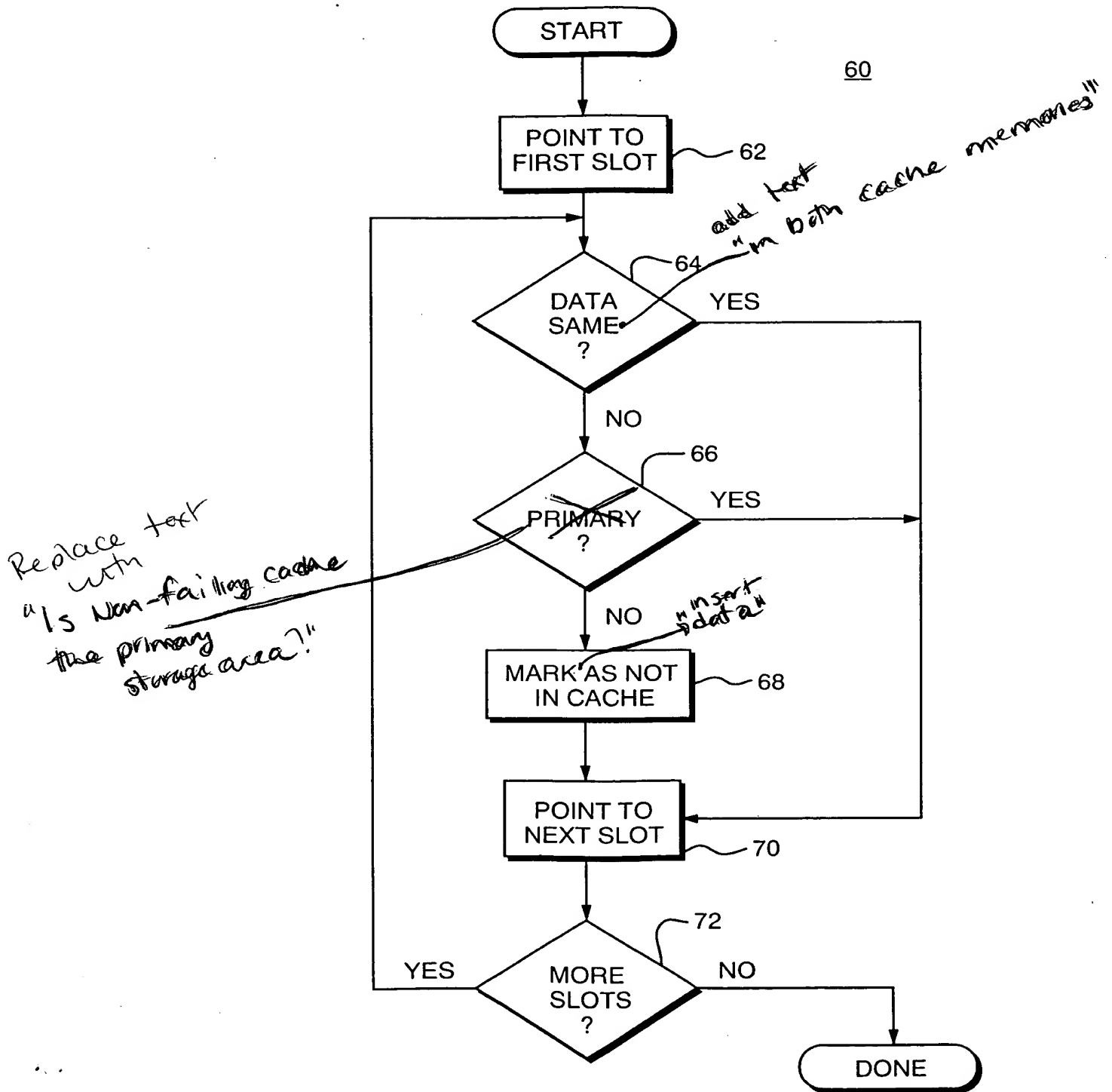


FIG. 5



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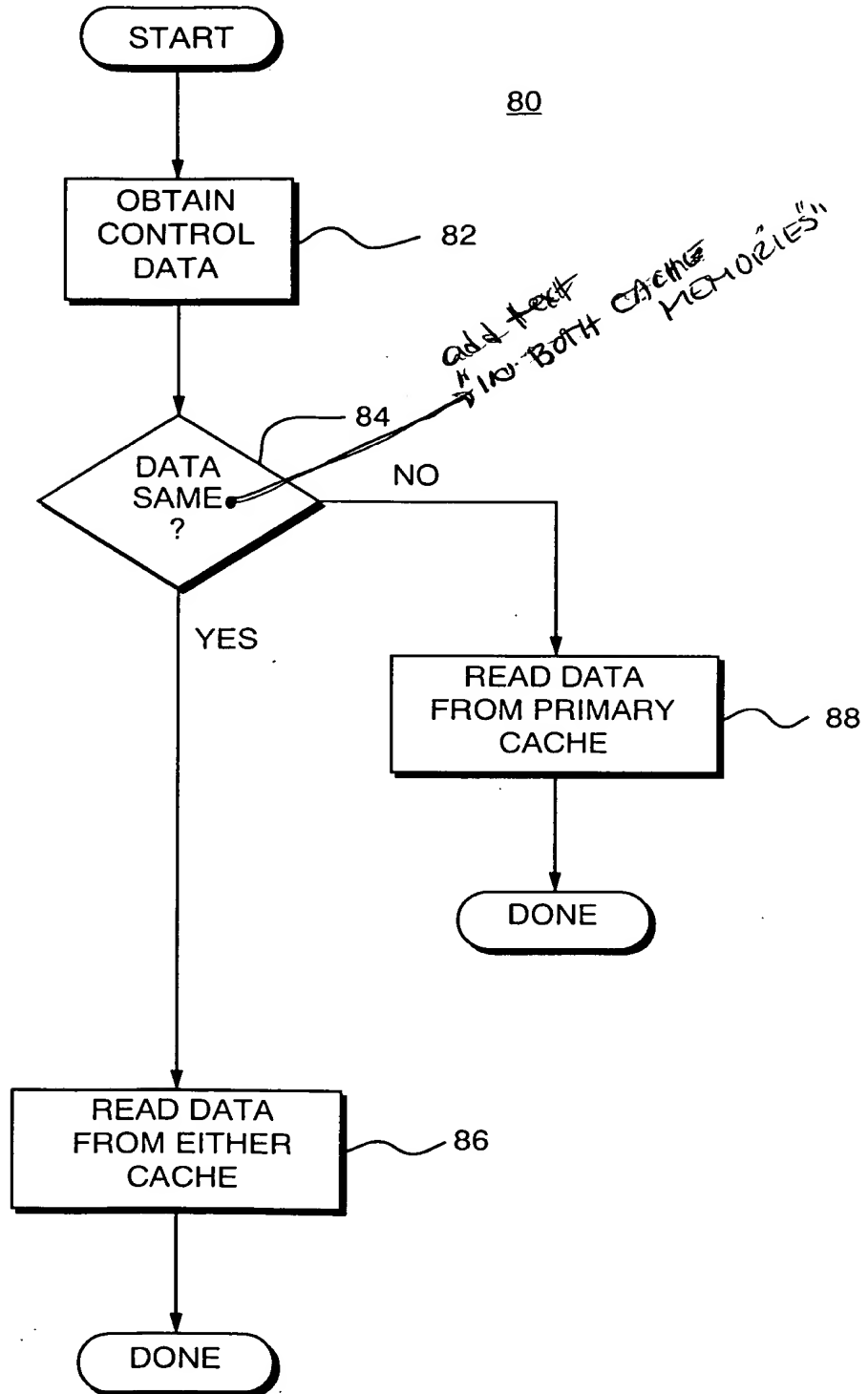


FIG. 6



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100 text to determine primary storage area

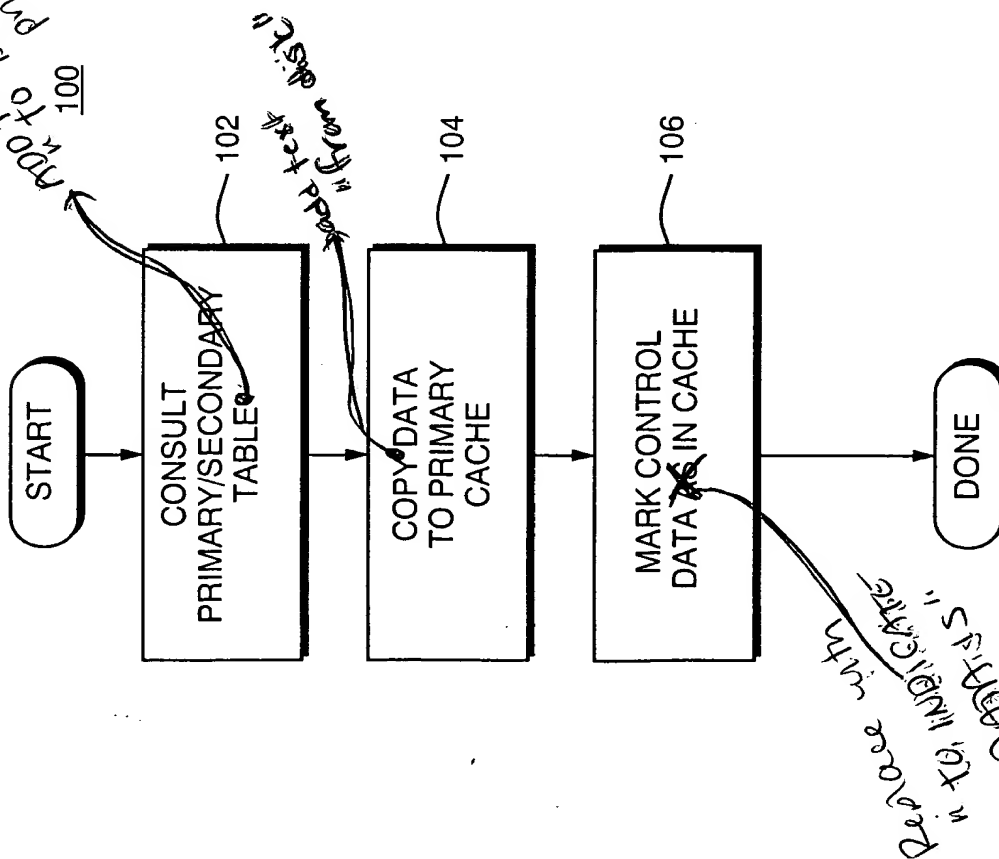


FIG. 7A

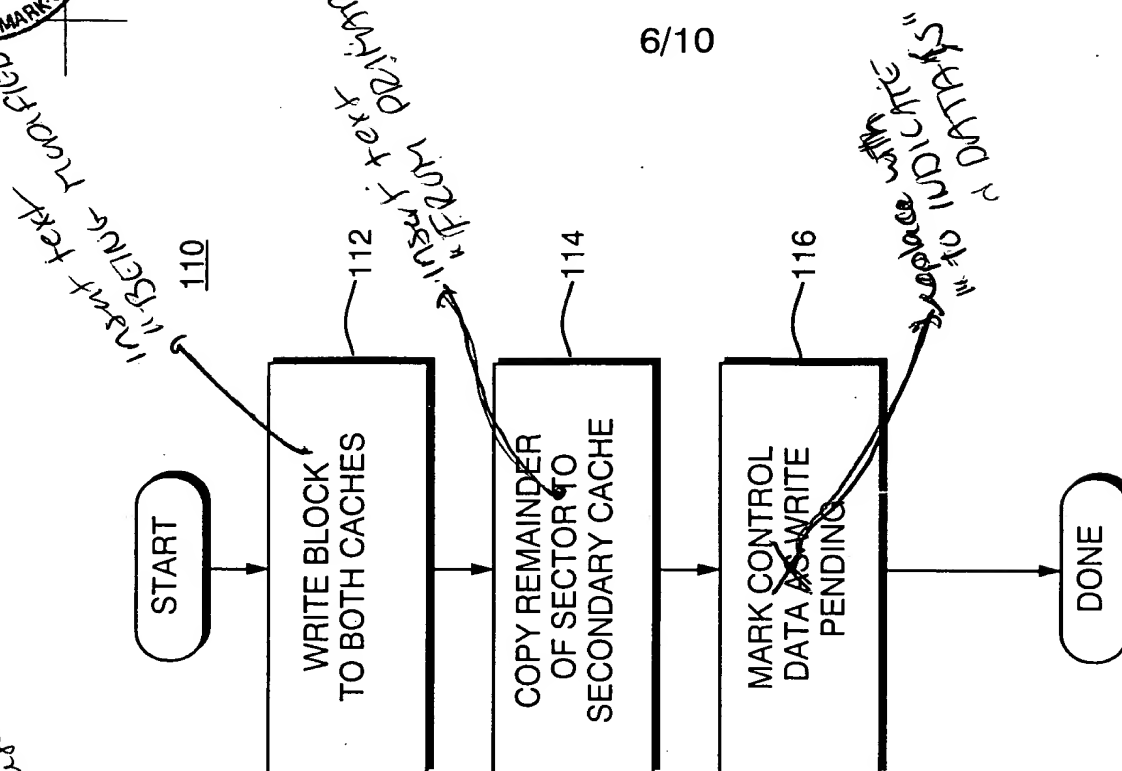


FIG. 7B



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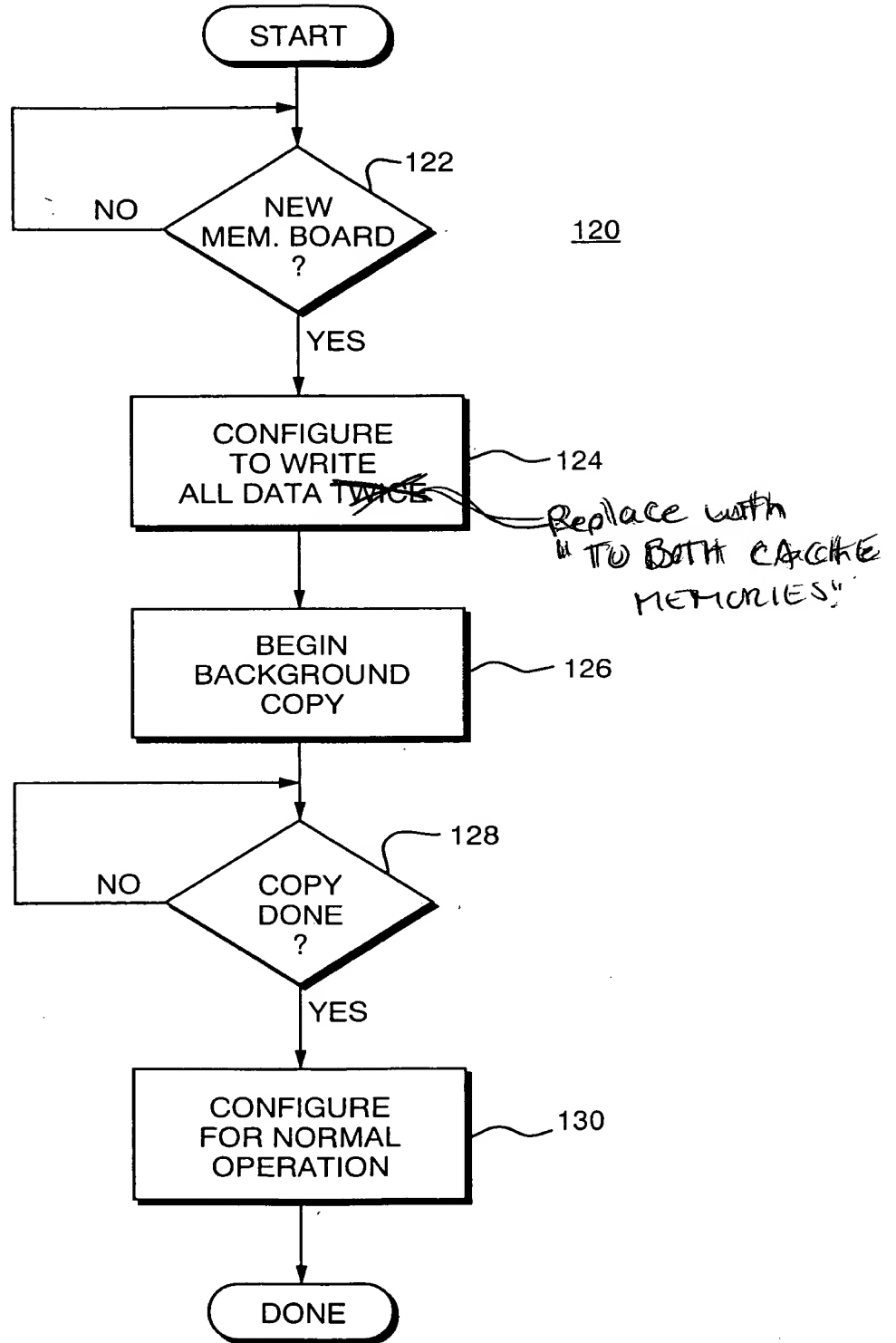


FIG. 8



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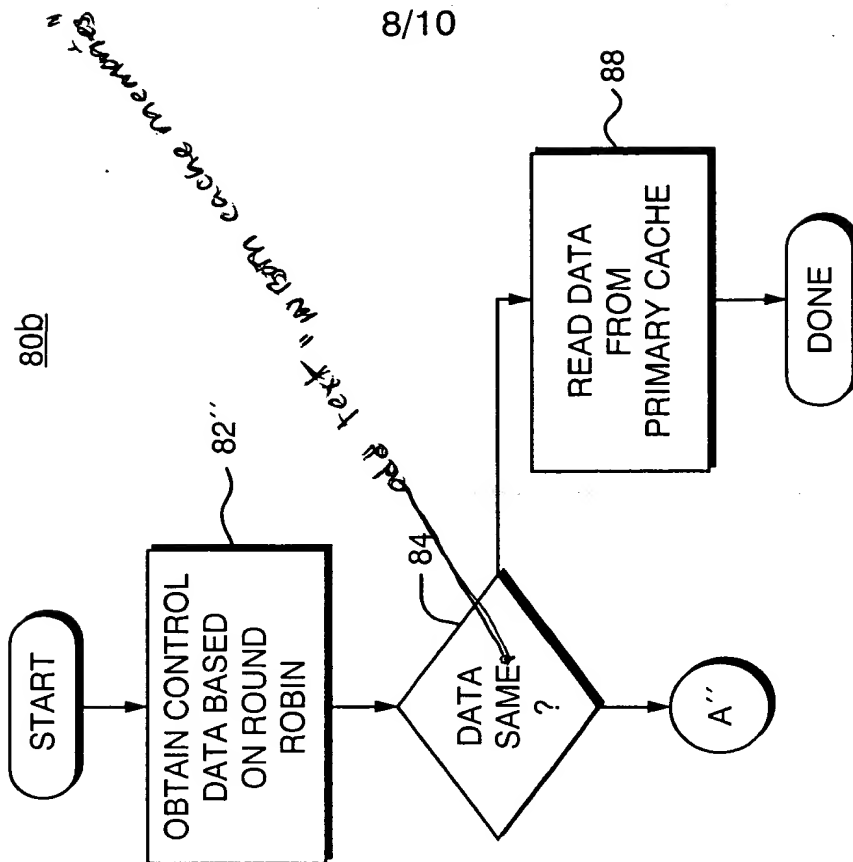


FIG. 10

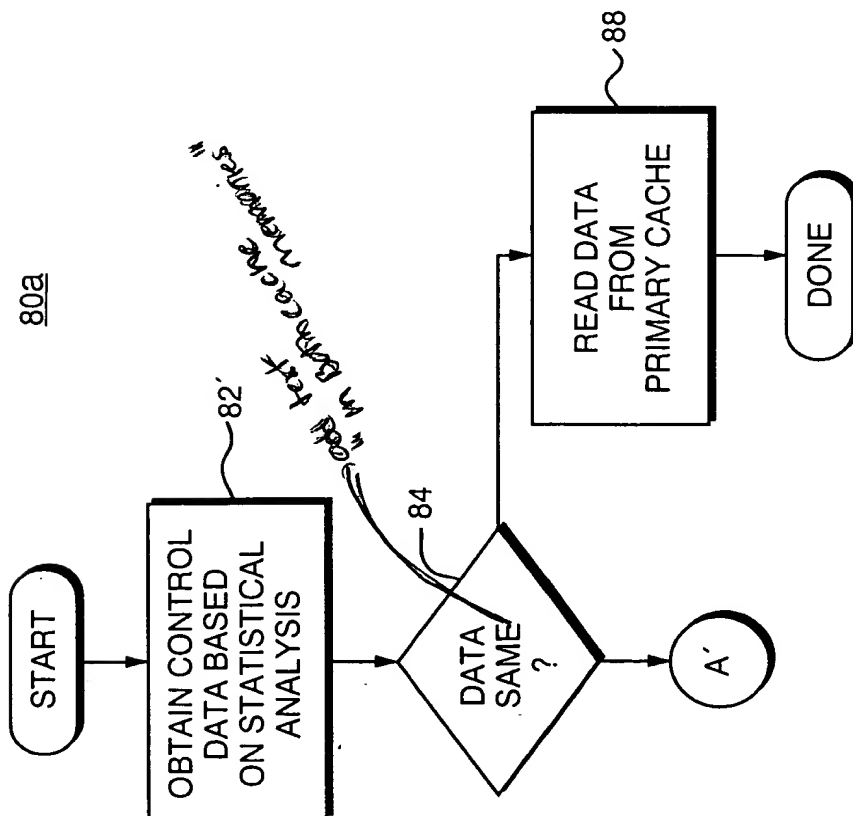


FIG. 9



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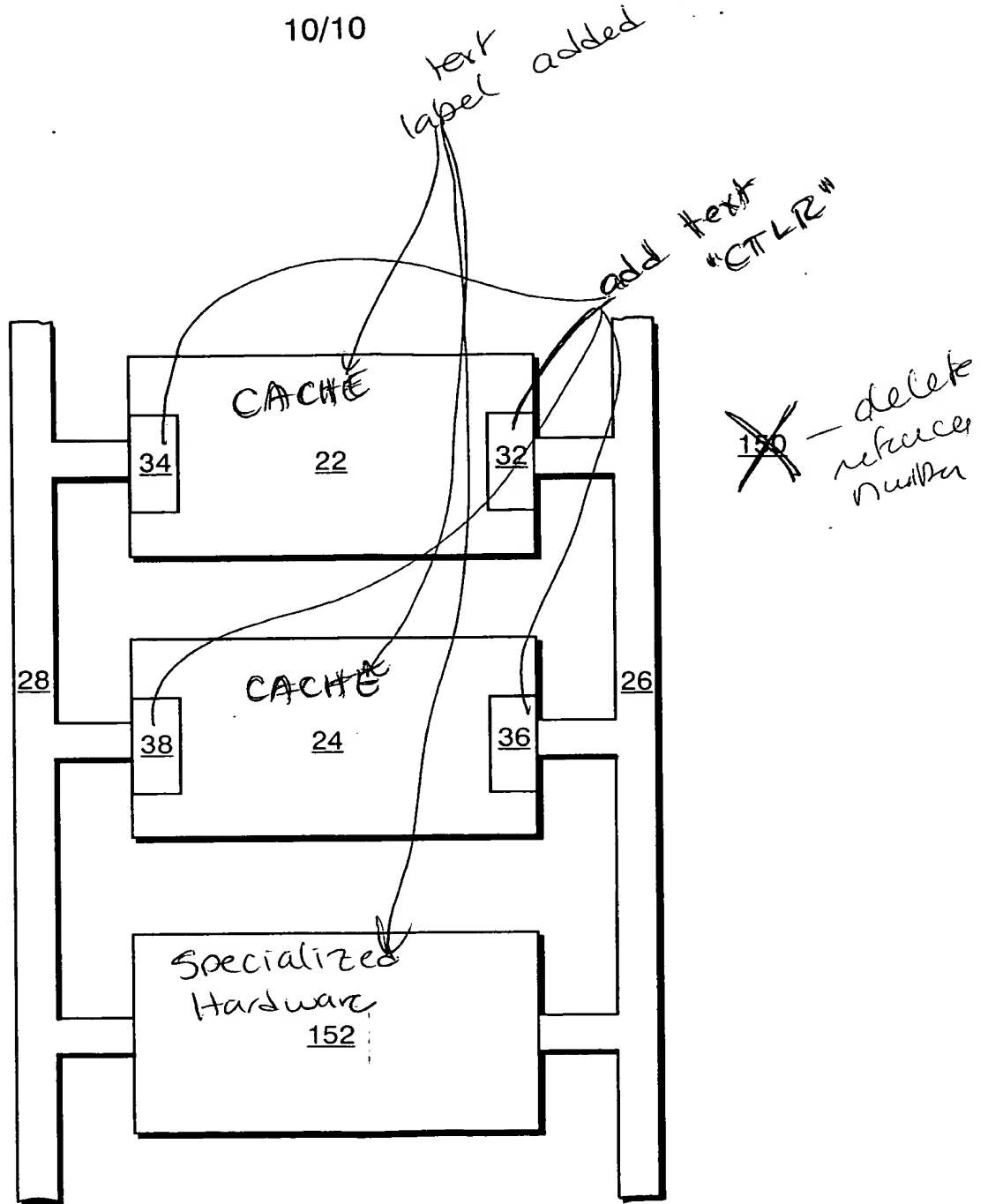


FIG. 14